ARKIV FÖR FYSIK Band 11 nr 48

Communicated 13 February 1957 by MANNE SIEGBAHN and ERIK RUDBERG

The X-ray absorption in polystyrene and formvar in the region 1—9 *k*XU

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With 2 figures in the text

The present investigation forms a continuation of an earlier one [1], where the X-ray absorption coefficients for cellulose acetate, cellophane, nylon, mylar and teflon were experimentally determined. All these materials and the two treated in this paper can be manufactured as thin foils and used as counting tube windows and substrates for absorbers. This makes it desirable to know their transparency to X-rays.

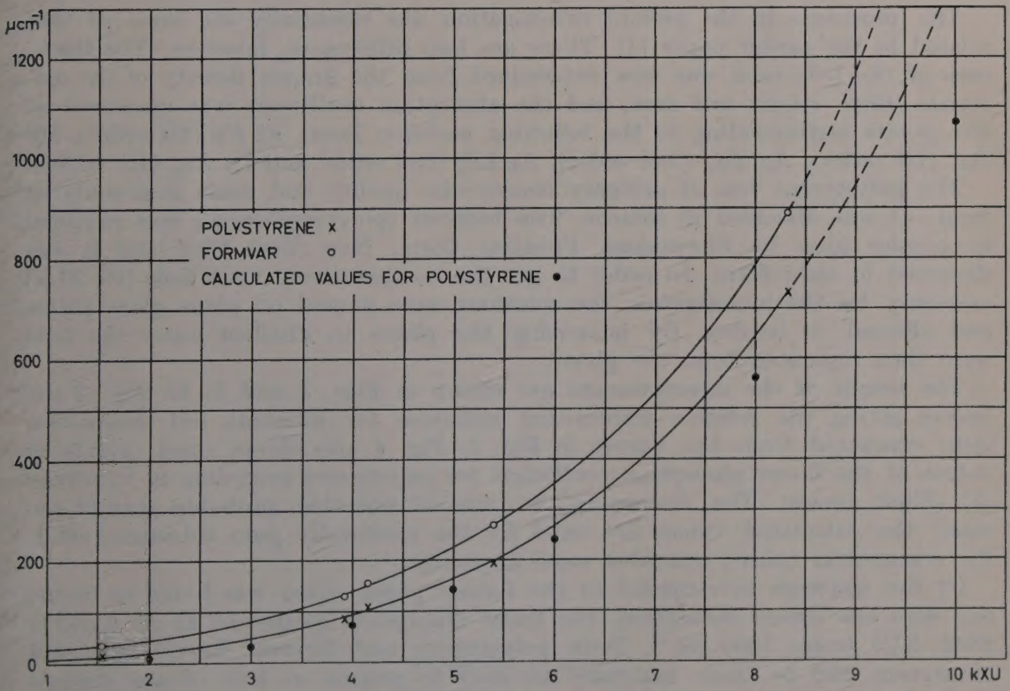

Fig. 1. Linear absorption coefficients of polystyrene and formvar. The calculated values for polystyrene are due to Victoreen [2].

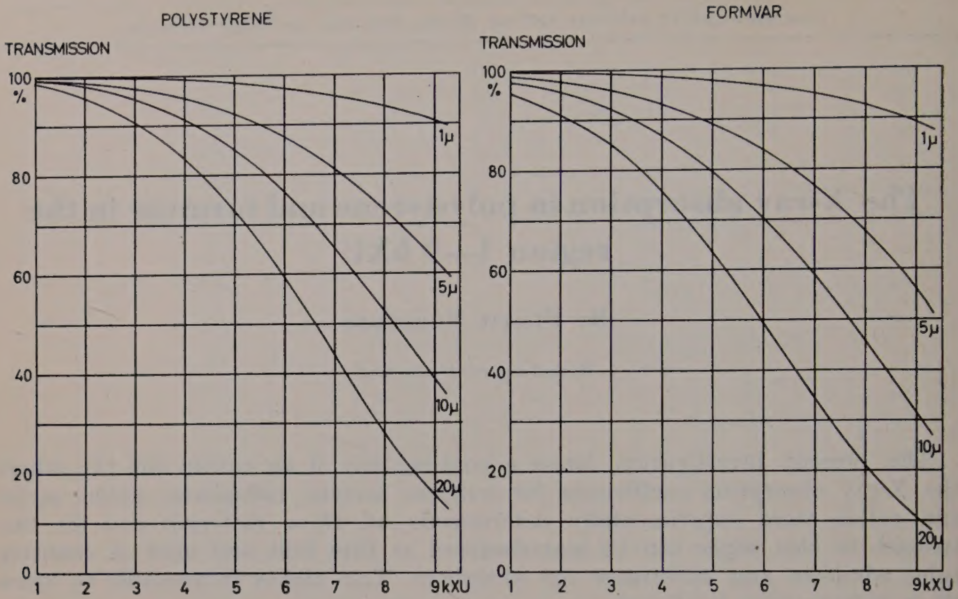

Fig. 2. The transparency of polystyrene and formvar for different foil thicknesses.

The procedure in the present investigation was essentially the same as that related in the earlier paper [1]. There are two differences, however. The thickness of the foils used was now determined from the known density of the materials, their weight and area, and the absorption coefficient was measured at five points corresponding to the following emission lines: Al $K\alpha$ (1st order), Mo $L\alpha_1$ (1st order), Ag $L\alpha_1$ (2nd order), Ag $L\beta_1$ (2nd order) and Cu $K\alpha_1$ (4th order).

The polystyrene was of ordinary commercial quality and came in granulated form. It was dissolved in toluene. The formvar (polyvinylformal) was supplied in powder form by Shawinigan Products Corp., New York City, and it was dissolved in chloroform. In order to get the comparatively thick foils (10–20 μ) necessary for the investigation the solutions were poured on plane glass plates and allowed to harden. By immersing the plates in distilled water the foils were then separated from the glass.

The results of the measurements are shown in Figs. 1 and 2. In Fig. 2 the curves giving the relative transmitted radiation for different foil thicknesses were computed from the curves in Fig. 1. Fig. 1 also shows some calculated values of the linear absorption coefficient for polystyrene according to Victoreen [2] (filled circles). The discrepancy is quite considerable, probably mainly because the calculated values are valid for the chemically pure substance while the commercial quality contains some impurities.

Of the materials investigated in the former paper nylon was found to be the one with the lowest absorption, the linear absorption coefficient at Al $K\alpha$ ($\lambda = 8322$ XU) being 1000 cm^{-1}. Both polystyrene and formvar have even lower absorption, and as these materials are easy to prepare as foils of any desired thickness they seem to be very suitable as counter windows or substrates for absorbers, especially in the region above 5 kXU.

This investigation as well as all work done with our large vacuum spectrograph is sponsored by the Swedish Natural Science Research Council.

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Tryckt den 25 april

Uppsala 1957. Almqvist & Wiksells Boktryckeri AB